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A REVIEW OF THE SILUROID FISHES OR CATFISHES OF JAPAN.

BY

DAVID STARR JORDAN

AND

HENRY W. FOWLER,

Of the Leland Stanford Junior University.

From the Proceedings of the United States National Museum, Vol. XXVI, pages 897-911.

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A REVIEW OF THE SILUROID FISHES OR CATFISHES OF JAPAN.

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In the present paper is given a review of the catfishes or *Nematognathi* known to inhabit the waters of Japan. The paper is based on the collections made by Messrs. Jordan and Snyder in 1900, a series of these specimens being placed in the U. S. National Museum.

Order NEMATOGNATHI.

CATFISHES.

Parietals and supraoccipital confluent. Four anterior vertebræ coossified, and with ossicula auditus or weberian apparatus. No mesopterygium. Basis cranii and pterotic bone simple; no coronoid bone. Third superior pharyngeal bone wanting, or small and resting on the fourth; second directed backward. One or 2 pairs of basal branchihyals; 2 pairs of branchihyals. Suboperculum wanting, or modified into the uppermost branchiostegal. Mesocoracoid present. Premaxillary forming border of mouth above, except in one family (*Diplomystidæ*), in which the maxillaries also bear teeth. Interclavicles present. No scales. Skin naked or with bony plates.

This group comprises 2 families, *Plotosidæ* and *Siluridæ* among Japanese fishes.

(*νῆμα*, thread; *γνάθος*, jaw; from the maxillary barbels which are always present.)

a. Air bladder well developed, usually simple or with transverse constructions, lying free in the abdominal cavity. Mouth terminal, teeth villiform, conical, incisor or molarlike; intestines short, arranged in longitudinal folds; body naked, or with 1 series of lateral plates; diaphragm membranous; tip of scapular process reaching basioccipital.

b. Dorsal and anal nearly coextensive with the caudal portion of the vertebral column; the first dorsal short, the second not adipose, united to the caudal; opercle present.

c. Gill membranes not confluent with the isthmus, or united only by a very narrow strip; gill-openings broad; 2 dorsals, the first short and with spine in front; second dorsal long and joined to caudal; anal united with caudal; no adipose dorsal; ventrals many-rayed; air-bladder not inclosed in bone. Plotosidæ, 1.

bb. Dorsal short or wanting; confined to the abdominal portion of the vertebral column.

d. Opercle well developed and movable; adipose fin normally present; gill-openings usually wide; caudal vertebræ not compressed, the neural spines simple, spine-like.

dd. Maxillary reduced to a rudiment, the intermaxillaries only forming margin of upper jaw ..... SILURIDÆ, 2.

Family I. PLOTOSIDÆ.

Body more or less elongate and naked. Front of head with at least 8 barbels. Gill-openings wide and the gill-membranes not confluent with the isthmus, or only narrowly united. Dorsals 2, the first short and with a spine in front, the second long and joined to the caudal; anal long and confluent with caudal. No adipose dorsal. Opercle present. A dentritic post-anal organ. Air-bladder not inclosed in bone.

Sea catfishes, often reaching a large size, and confined to the warm and tropical coasts of the Indian Ocean, the seas about the East Indies, and Australia, one species extending its range eastward to Samoa.

1. PLOTOSUS Lacépède.

Plotosus LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 130 (*anguillaris*).

Body elongate, thick in front, and the tail tapering. Head depressed and covered with thin skin; snout rounded in front; eyes small; mouth transverse; jaws with 8 barbels; conical teeth in upper jaw, those on the mandible mixed, and vomer with molar-like teeth; nostrils far apart, the anterior tubular; 9 to 12 branchiostegals. Gill-openings wide, the gill-membranes not joined to the isthmus. Dorsals 2, the first short, few-rayed, and with a spine in front, and the second very long, many-rayed and like the anal, confluent with caudal; pectoral spines developed; ventrals with as many as 12 rays. Air vessel moderate in size and not inclosed in bone. A dendritic post-anal organ. East Indian Seas, from Africa and India to Japan.

(πλωτός, floating.)

1. PLOTOSUS ANGUILLARIS (Lacépède).

GIGI (CATFISH), SHIMAGIN (STRIPED CATFISH), UMIGIGI (SEA CATFISH.)

Plotosus anguillaris LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 130, pl. III, fig. 2; "Les Grandes Indes."—RÜPPELL, Fische, Neue Wirbelthiere, 1837, p. 76; Red Sea.—CANTOR, Catal. Malay. Fish., 1850, p. 264; Malayan Peninsula.—BLEEKER, Ichthy. Archipel. Ind. Prodrom. Siluroid, 1858, p. 314.—GÜNTHER, Cat. Fish., V, 1864, p. 24; Pinang, Sumatra, Borneo, Amoy, Philippines, Fiji, Marston Bay.—STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1887, p. 287; Tokyo, Enoshima, Inland Sea, and Kagoshima.—ISHIKAWA, Prel. Cat., 1897, p. 24; Tokyo, Izu.

Plotosus lineatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XV, 1840, p. 412; Red Sea, Seychelles, Malabar, Ile de France, Trinquemalo, Pondicherry, Amboina, Celebes, Friendly Islands, Tahiti, Macao, Philippines.—RICHARDSON, Ichth. China, 1846, p. 286; Canton.—SCHLEGEL, Fauna Japonica Poiss.,[a] 1846, p. 228, pl. CIV, fig. 3; Nagasaki.—BLEEKER, Verhand. Batav. Genootsch., XXI, 1858, pp. 4, 17, 57.

Plotosus arab[b] BLEEKER, Atlas Ichth., II, 1862, p. 98, pl. XCV, fig. 2 (several figures), founded on "36 (Silurus) (d) Arab *Boa* vel *Buja*" of Forskål Descript. Animal., 1775, p. XVI.—DAY, Fishes India, I, 1878–88, p. 483, pl. CXII, fig. 4.—DAY, Fauna Brit. Ind., I, 1889, p. (XI) 113.—KNER, Novara, Fische, 1865–67, p. 300.—DAY, Fishes, Malabar, 1865, p. 195.—KLUNZINGER, Verhand. Zool. Botan. Gesellsch., 1871, p. 588.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 340; Tokyo.—JORDAN and SNYDER, Annot. Zool. Japan, III, April 3, 1901, p. 44; Yokohama.

Head $3\frac{7}{8}$ in length; depth $5\frac{3}{4}$; D. I, 5–80; A. 68; P. I, 10; V. 12; width of head about $1\frac{1}{2}$ in its length; eye $2\frac{1}{2}$ in interorbital space, 3 in snout, $7\frac{1}{2}$ in head; pectoral 2 in head; ventral $2\frac{1}{2}$.

Body elongate, the trunk thickest in front, compressed laterally, and the tail rather long and tapering. Head large, broad, depressed; when seen from above, the snout is broadly rounded and flattened; eyes small, anterior and superior; mouth very broad; upper jaw produced; teeth in the jaws rather few, large, coarse, with blunt ends, and similarly formed on the vomer and palatines; lips rather thick, fleshy and with small laminated folds or papillæ; 8 barbels, more or less equal, and distributed as 2 nasals, 2 maxillaries, and 4 mentals, the longest not equal to half the head; interorbital space concave and broad. Gill-openings large, and forming a fold over the broad isthmus. Gill-rakers numerous and slender; no pseudobranchiæ.

Body perfectly smooth and naked.

First dorsal high, its base less than the interorbital space, the spine strong, a little more than half the height of the fin, and the anterior edge serrate above; second dorsal long, of uniform height, and beginning between the origin of the ventrals and that of the anal; anal similar to second dorsal, and both joined to the caudal, which is rounded behind; pectorals equal to first dorsal, the spine similar to that of the first dorsal, more than half the length of the fin, and with its outer edge serrate; when depressed the pectorals do not reach quite to the ventrals, though these reach past the anal. The lateral line is well developed. A well-developed dendritic post-anal organ.

[a] We are indebted to Mr. Edgar R. Waite, of the Australian Museum, for the dates of publication of the different parts of the Fauna Japonica. These are as follows: Decade I, pp. 1–20, 1842; Decades II, III, IV, pp. 21–72, 1843; Decades V, VI, pp. 73–112, 1844; Decades VII, VIII, IX, pp. 113–172, 1845; Decades X to XIV, pp. 173–269, 1846; Decade XV, pp. 270–324, 1850.

[b] The specific name *arab* adopted by Bleeker from Forshål was an abbreviated form of the word *Arabic* or its Latin equivalent, and should in no wise be construed as a scientific term.

Color in alcohol brown, pale on the abdomen and lower surface of the head; along the upper portion of the sides, a narrow pale line from snout above eye to near base of caudal above, and from below eye another similar narrow stripe below lateral line and persisting to the posterior portion of tail; edges of second dorsal, caudal and anal blackish.

Length 8¼ inches.

This description is taken from a specimen from Misaki. The species is found through the shore waters of east Africa, Red Sea, southern Asia, the East Indies to Polynesia and Japan.

Our many specimens from Tokyo, Misaki, Wakanoura, Mogi, and Nagasaki.

This species is very abundant along the shores of shallow sandy bays throughout southern Japan. It rarely exceeds a foot in length. It is not much value as food, and its sharp spines cause it to be detested by the fishermen. Great numbers are taken in the shallow bay of Mogi near Nagasaki.

(*anguillaris*, eel-like.)

Family II. SILURIDÆ.

Body more or less elongate, naked or covered with bony plates. No true scales. Anterior part of head with 2 or more barbels, the base of the longest pair formed by the small or rudimentary maxillary. Margin of upper jaw formed by premaxillaries only. Suboperculum absent; operculum present. Dorsal fin usually present, short, above, or in front of the ventrals. An adipose fin usually present. Anterior rays or dorsal and pectorals usually spinous. Air bladder usually present, large, and connected with the organ of hearing by means of the auditory ossicles. Lower pharyngeals separate. Species numerous, mostly in fresh waters, the large subfamily of *Ariinæ* confined to the sea. None of these occur in Japan proper.

a. Gill membranes free or forming a free fold across the isthmus, rarely joined to it; anal fin shorter than caudal portion of vertebral column.

b. ARIINÆ. Nostrils close together, neither with a barbel, the posterior with a valve; teeth on the palate; caudal forked (species chiefly marine).

c. Lower jaw with 4 barbels; palatine teeth fixed; both jaws with teeth above; gill-rakers few, 5 to 25; eyes above level of the mouth.....*Tachysurus*, 2.

bb. Nostrils remote from each other.

d. SILURINÆ. Dorsal and adipose fins very short, if present; anal very long; ventrals below or placed behind dorsals; gill membranes entirely separate.

e. Eye situated above the level of the angle of the mouth; caudal rounded; adipose fin none; barbels four; spinous dorsal small.... *Parasilurus*, 3.

dd. BAGRINÆ. Dorsal fin short, placed anteriorly on the trunk, in advance of ventrals; adipose fin well developed, sometimes short; anal short, or of moderate length; gill membranes not confluent with the skin of the isthmus, with free posterior margin.

f. Adipose fin not adnate, free behind, as in *Ameiurus;* mental barbels as usual, the median pair not notably distant.

g. Anal rays 20 to 25.

h. Caudal fin deeply forked; upper surface of head bony and granulated, the skin covering the bones being very thin.. *Fluvidraco*, 4.

hh. Caudal fin subtruncate; upper surface of head covered with thick smooth skin, concealing the bones ..... *Pseudobagrus*, 5.

gg. Anal rays 14 to 17; eyes very small; head covered with soft skin; caudal deeply forked..... *Leiocassis*, 6.

ff. Adipose fin adnate to the back and connected with the caudal; caudal rounded; median mental barbals far apart; body elongate; head small, smooth above; dorsal well forward..... *Liobagrus*, 7.

2. TACHYSURUS Lacépède.

Tachysurus LACÉPÈDE, Hist. Nat. Poiss., 1803, p. 151, pl. v, fig. 2 (*Sinensis*).

Arius [a] CUVIER and VALENCIENNES, Hist. Nat. Poiss., XV, 1840, p. 52, in part, not the "chef de file" or type (*grandicassis, arius,* etc.; restricted to *Pimelodus arius* by Bleeker in 1858 = *Tachysurus*).

Ariodes MÜLLER and TROSCHEL, Horæ Ichthyol., III, 1849, p. 9 (*arenarius*, etc.) (= *Tachysurus*).

Pseudarius BLEEKER, Ichth. Archipel. Indi. Prodrom. Siluroid., 1858, p. 91 (*Pimelodus arius; grandicassis* being regarded as type of *Arius.*)

Body more or less elongate, subterete. Head armed with a bony shield above, behind which projects an occipital shield, another smaller crescent-shaped shield at the base of the dorsal spine, these processes and bones exposed or covered with very thin skin, and the bones on top of the head together with the occipital process granular; skull with a fontanelle; eyes with a more or less free orbital margin; mouth not large, the upper jaw the longer; teeth in jaws villiform, more or less granular, in a band in each jaw; palatine patches of teeth granular, without a backward projecting angle on the inner margin, and never movable; barbels 6 (no nasal barbels), close together, the posterior with a valve; maxillary barbels usually short and terete or somewhat compressed. Gill membranes not forming a free margin across the isthmus. Skin smooth, naked, except on the head above. Dorsal fin short, in front of ventrals with a pungent spine; adipose fin well developed, posteriorly free; caudal fin deeply forked; anal fin short; pectorals each with a spine; ventral rays six. General color brown with blue reflections.

Marine catfishes. The species abundant on sandy shores in the tropical seas, never about coral reefs. None of them occur in Japan proper.

(ταχύς, swift; οὐρά, tail.)

[a] The generic name *Arius* may, however, properly be retained for *Arius grandicassis*, Valenciennes's "chef de file" or type, thus replacing *Netuma*, although the name *Arius* is derived from an Indian name *Ari*.

2. TACHYSURUS MACULATUS (Thunberg).

Silurus maculatus THUNBERG, Vet. Acad. Nya. Handl., XIII, 1792, p. 31, pl. I, fig. 1; Japan.

Arius maculatus GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, p. 166.

Tachysurus maculatus JORDAN and SNYDER, Annot. Zool. Japan, III, April 3, 1901, p. 45; no locality.

Silurus ocellatus BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 379 (after Thunberg).

Arius ocellatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XV, 1840, p. 104 (after Bloch and Schneider).

Arius ocellatus BLEEKER, Verhandl. Batavia, Genootsch. Kunst. Wetensch., XV, 1853, pp. 30 and 51.

Pimelodus arius HAMILTON-BUCHANAN, Fishes of Ganges, pp. 170, 376; Bengal.

Arius arius CUVIER and VALENCIENNES, Hist. Nat. Poiss., XV, 1840, p. 102; Pondicherry.

Arius gagorides BLEEKER, Verh. Bat. Gen., XXI, Silur., p. 42; East Indies.

Arius chondropterygioides BLEEKER, Verh. Bat. Gen., XXI, Silur., p. 44; East Indies.

Arius angulatus BLEEKER, Verh. Bat. Gen., XXI, Silur., p. 44; East Indies.

Arius heckeli BLEEKER, Verh. Bat. Gen., XXI, Silur., p. 44; East Indies.

Pseudarius borneensis BLEEKER, Atl. Ichthy. Silur., p. 36, pl. XIX; Borneo.

Head $3\frac{2}{5}$ to $3\frac{1}{4}$ in length; depth $4\frac{2}{5}$ to 5; D. I, 7; A., 20 to 22; P. I, 10. Head rather broader than high, its greatest width $\frac{2}{3}$ to $\frac{3}{4}$ its length; band of intermaxillary teeth is six times as long as broad; teeth on the palate granular, in two separate semiovate patches; maxillary barbels considerably shorter than the head; occipital process granulated, subtriangular, scarcely longer than broad. Dorsal fin higher than body; its spine strong, serrated along both edges, and it is contained $1\frac{1}{5}$ to $1\frac{2}{3}$ in the head; adipose fin rather shorter than dorsal; pectoral $\frac{2}{3}$ to $\frac{5}{6}$ the length of the head, and its spine nearly as long as that of the dorsal fin. Adipose fin with a large black spot. (Günther.)

East Indies and China, only known from Japan in the record of Thunberg, which was probably made at Miyako Island in the Riukiu archipelago.

The synonymy above given is compiled from authors and needs verification.

(*maculatus*, spotted.)

3. PARASILURUS Bleeker.

Glanis AGASSIZ, Proc. Amer. Acad., 1856, p. 333 (*aristotelis*). (Name preoccupied by *Glanis* Gronow, 1854.)

Parasilurus BLEEKER, Nederl. Tydschr. Dierk., 1863, p. 114 (*asotus*).

Body elongate, the profile of the back almost horizontal. Head depressed and covered with soft skin; eyes anterior and subcutaneous; mouth broad, transverse; barbels 4, two very long maxillaries and 2 short mentals; teeth cardiform or villiform, in broad bands in the

jaws and on vomer; no teeth on palatines. Gill opening wide, not confluent with the isthmus, and narrowly joined together. Dorsal small, without spine, and anterior; adipose fin absent; anal more or less united with the caudal, very long; pectorals with spine; ventrals behind dorsal. Air bladder not inclosed in bone. Fresh-water Siluroids found in India, East Indies, China, and Japan.

This genus is very close to *Silurus* and distinguished chiefly by the number of barbels, which are 6 in that genus. The preoccupied name *Glanis*, based on the species of this genus found in Greece (*Glanis aristotelis*), is, as Garman has shown, a synonym of the later *Parasilurus*.

(παρά, near; *Silurus*.)

3. PARASILURUS ASOTUS (Linnæus).

NAMAZU (MUD-FISH).

Silurus asotus LINNÆUS, Syst. Nat., 10th ed., 1758, p. 501; Asia.—BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 378.—BASILEWSKY, Nouv. Mém. Soc. Nat. Mos., X, 1855, p. 240, pl. III, fig. 4; Pechili, China.—GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, p. 33; Japan, China.—ISHIKAWA, Prel. Cat., 1897, p. 23; Tokyo, Suwa, Mino, Hikone.

Silurus japonicus SCHLEGEL, Fauna Japonica, Pisc., 1846, p. 226, pl. CIV, fig. 1; Higo, Satsuma, Nagasaki.—BLEEKER, Verhandel. Batavia Genootsch. Kunst. Wetensch., XXV, 1853, pp. 30 and 51.

Silurus asotus STEINDACHNER and DODERLEIN, Denk. Akad. Wissensch., LIII, 1887, p. 287; Tokyo.—SAUVAGE, Bull. Soc. Philomat. (Paris) 1883, p. 2; Lake Biwa.

Parasilurus asotus JORDAN and SNYDER, Check List, p. 45; Yokohama, Lake Biwa.

Head $4\frac{3}{5}$ in length; depth $5\frac{4}{8}$; D. 6; A. 78; P. I, 13; V. 12; width of head two-thirds its length; eye about 9 in head; $2\frac{1}{2}$ in snout; 5 in interorbital space; pectoral $1\frac{3}{4}$ in head; ventral $2\frac{1}{4}$.

Body elongate, the trunk deepest in front, compressed laterally, and the tail long and tapering. Head moderate, broadly depressed; when viewed from above the snout is broadly rounded and flattened; eyes small, lateral, and anterior; mouth very broad and superior, the mandible projecting; teeth sharp, in broad villiform bands in the jaws and on vomer and palatines; lips rather thin and smooth; nostrils rather far apart, the anterior in a small tube; barbels 4, 2 very long maxillaries and 2 short mentals; interorbital space very broad, elevated, and flattened in the middle. Gill-openings large, very narrowly jointed, and separate from the very broad isthmus. Gill-rakers few and rather short; no pseudobranchiæ.

Body perfectly smooth and naked.

Dorsal a little shorter than the ventral and inserted just before the tip of the pectoral; anal very long, united with the caudal behind, of uniform height, and its origin much before the middle of the length; pectoral spine stout, both edges with strong denticulations, and about

three-fifths the length of the fin; pectorals not reaching the ventrals, which are shorter and reach beyond the origin of the anal; tail slightly emarginate, the lobes distinctly rounded and the upper projecting a little.

Lateral line present. Anal papilla present.

Color, in alcohol, brown, the middle of the back darker; lower surface of the head and the abdomen whitish.

Length 10½ inches.

This description from a specimen from Tokyo, collected by K. Otaki.

China and Japan, our specimens from Tokyo, collected by K. Otaki, Nügata, Morioka, Tana River, Kawatana, Sendai, Ichinoseki, Chikugo River at Kurume, Tsuchiura, Lake Biwa at Matsubara, and Formosa.

This large catfish is very common in all the streams of middle and southern Japan, reaching a length of 2 or 3 feet. It is largely used as food. The Japanese species (*Parasilurus japonicus*) is considered by authors, doubtless correctly, as identical with *Parasilurus asotus*, a species widely distributed in eastern Asia.

(*asotus*, a sot.)

4. FLUVIDRACO Jordan and Fowler.

Fluvidraco Jordan and Fowler, new genus (*ransonnetii*).

This genus is close to *Pseudobagrus*, differing in the deeply forked caudal and in having the top of the head rough and granulated, the covering skin being very thin. Rivers of Japan and China. The "Yellow Dragon" of Canton, *Fluvidraco fulvidraco* (Richardson), seems to belong to this genus.

(*fluvius*, river; *draco*, dragon.)

a. Outer edge of pectoral spine without serrations; bony occipital bridge and humeral processes granulate and covered with thin skin; anal rays 20 . . *ransonneti*, 4.

aa. Pectoral spine strongly serrated (along both edges?); head granulated above; anal rays 23 . . . . . *nudiceps*, 5.

4. FLUVIDRACO RANSONNETII (Steindachner).

Pseudobagrus ransonnetii Steindachner, Fische Japans, IV, 1887, p. 287; Osaka.—Jordan and Snyder, Annot. Zool. Japan, III, 1901, p. 44.

Pseudobagrus fulvidraco Ishikawa, Prel. Cat., 1897, p. 23 (not of Richardson); Lake Biwa, Hikone, Yamashiro, Tosa; Katsuura R.

Head 4¼ in length; depth 6; D. I, 7; A. 20; P. I, 7; V. 6; width of head 1⅓ in its length; eye 5 in head; 1½ in snout; 2¼ in interorbital space; pectoral 1⅓; ventral a little more than half the head.

Body elongate, compressed. Head broad, depressed; snout broad, obtuse, depressed, and flattened above; eye moderate, anterior lateral, and more or less covered with the skin of the head; mouth very broad, transverse, and its width about 2¾ in the head; teeth in broad villiform bands in the jaws, and the roof of the mouth also with a broad trans-

verse band; 8 barbels, the nasals and median mentals about equal, shorter than the outer mentals; which are not as long as the maxillaries, the latter reaching beyond the gill-openings, and all of the mentals rather evenly distributed; lips moderately thick; interorbital space broad, flattened, and very slightly elevated; anterior nostrils tubular and in a shallow depression. Gill-openings large, the membrane deeply notched and forming a free fold across the isthmus; the isthmus broad. Gill-rakers narrow, 3+9.

Body smooth, top of the head smooth, the occipital process and the plate in front of the spinous dorsal finely striate or granular; humeral process finely granular.

Origin of dorsal in advance of tip of pectoral spine, its spine long, sharp, smooth, and shorter than the longest rays; base of anal long, and its origin nearer the posterior margin of eye than tip of caudal; caudal shorter than head, deeply forked, the lobes somewhat pointed, and the

FIG. 1.—FLUVIDRACO RANSONNETII.

upper the longer; pectoral equal to head without snout, the spine smooth, except along its posterior edge, which is armed with strong recurved teeth; ventrals broad and reaching origin of anal; adipose fin long, though less than the base of the anal, and its posterior edge not adnate and not extending beyond posterior tip of anal, its form much as in Ameiurus. Anal papilla developed. Lateral line present.

Color brown, darker above, the abdomen and lower surface of the head pale or whitish; the edges of the dorsal, anal, caudal, pectorals, and ventrals broadly blackish.

Length 5¾ inches.

Rivers of Japan, common southward. Our specimens are from Waka River, near Wakanoura, Tsuruga, Matsubara on Lake Biwa, Lake Yogo in Mino, the Yodo River in Osaka, and Nagoya in Owari, the last from the collection of K. Otaki.

(Named for Baron Ransonnet, who obtained the species at Osaka.)

5. FLUVIDRACO NUDICEPS (Sauvage).

Pseudobagrus nudiceps SAUVAGE, Bull. Soc. Philomat., 1883, p. 2; Lake Biwa.

The original description is as follows:

D. I, 6; A. 23; P. I, 7. Longueur de la tête contenue cinq fois dans la longueur totale; dessus de la tête osseux, granuleux; processus occipital plus long que large, étroit; os basilaire triangulaire, aussi long que le processus occipital, partagé par une suture transverse. Dorsale plus haute que le corps; épine dentelée, aussi longue que la tête, sans le museau. Épine pectorale la même longueur que l'épine dorsale, de même longueur que celle-ci, très fortement dentelée. Adipeuse de même longueur que l'anale. Dents du palais suivant une bande rétrécie au milieu; barbillons maxillaires s'étendant jusqu'aux pectorales. Longueur, 0,090.

This species is near *Fluvidraco fulvidraco* (Richardson), of the streams of Canton. It is also near *Fluvidraco ransonnetii*, and may even be the same. There is no evidence that *Fluvidraco fulvidraco* occurs in Japan.

(*nudus*, naked; *ceps*, head.)

5. PSEUDOBAGRUS Bleeker.

Pseudobagrus BLEEKER, Act. Soc. Sci. Indo-Nederl., VII, 1860, p. 87 (*aurantiacus*).

Body moderately elongate. Head broad and depressed, covered above by moderately thick, smooth skin; eyes moderate or rather small; snout broad, obtuse; mouth broad, transverse, and with bands of villiform teeth in the jaws; a continuous transverse band of teeth on the roof of the mouth; nostrils remote, the anterior usually in a small tube; 8 barbels, the maxillaries the longest, and the mentals more or less evenly distributed. Dorsal fin short, with 5 to 7 rays, and like the pectoral with a stout spine; caudal rounded or subtruncate; anal with 20 or more radii; ventrals broad, with 6 rays.

(ψεύδης false; *Bagrus*).

6. PSEUDOBAGRUS AURANTIACUS (Schlegel).

GIGI; GIBACHI.

Bagrus aurantiacus SCHLEGEL, Fauna Japonica, 1846, p. 227, pl. CIV, fig. 2; Satsuma, Kuruma, Higo.

Pseudobagrus aurantiacus BLEEKER, Act. Soc. Sci. Indo-Nederl., VII, p. 85.—GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, p. 85.—SAUVAGE, Bull. Soc. Philomat., 1883, p. 2; Lake Biwa.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 340; Tokyo; Annot. Zool. Japan, III, April 3, 1901, p. 44.—ISHIKAWA, Prel. Cat., 1897, p. 22; Tokyo, Chichibu, Suwa. Tęga Lake.

Pseudobagrus tokiensis DÖDERLEIN, Fische Japans, IV, 1887, p. 288; Tokyo.—JORDAN and SNYDER, Annot. Zool. Japan, II, April 3, 1901, p. 45.

Head, $5\frac{1}{6}$ in length; depth, 7; D. I, 7; A., 20; P. I., 7; V., 6; eye, $4\frac{1}{2}$ in interorbital space; width of mouth, 2 in head; pectoral, $1\frac{1}{2}$ in head; ventral, 2.

Body elongate, with rather uniform depth, the tail strongly compressed. Head broad, depressed; snout short, bluntly rounded when viewed from above and projecting beyond the mandible; the width of the head is less than its length; eyes small, laterally superior, and cov-

ered with thin skin; jaws with broad bands of villiform teeth, also on the palate in a broad transverse band; lips moderately thick and slightly papillose; nasal and median mental barbels about equal, about half the length of the maxillary pair, which latter are much longer than the outer mentals, though considerably shorter than the length of the head; the mental barbels are all rather evenly distributed, the median pair slightly farther apart than either is from the outer, the interorbital space is broad, elevated, and flattened; anterior nostrils tubular and in a shallow pit. Gill openings large, the gill membrane deeply notched and forming a free fold across the isthmus; isthmus broad. Gill rakers narrow, 3+7.

Body smooth; top of the head smooth; humeral process finely granular.

Origin of dorsal, above the tip of pectoral, its spine sharp and half the length of the dorsal; anal base rather long; caudal truncate, its edge rounded, very slightly emarginate, and with the two lobes rounded, the upper slightly the longer; adipose dorsal much shorter than anal and ending before tip of anal; pectoral with robust roughened spine, the inner edge with large teeth, falling short of the end of the fin; ventral broad, behind dorsal and reaching almost to the origin of the anal. Anal papilla well developed. Lateral line well developed and superior in front; head with a number of pores.

Color brown, dark above, clouded with deep brown, the abdomen and lower surface of the head pale or whitish.

Total length 9½ inches.

This description from our largest specimen taken in the Kitakami River.

This species is abundant in the streams throughout most of the islands of Japan, our specimens from Tokyo, Kinu River at Utsunomiya, Tana Kiver at Tachikawa, Tsuchiura, and Kitakami River at Morioka. It is often spitted on sticks, roasted, and sold cold in the shops and eating houses. It rarely exceeds a foot in length. The *Pseudobagrus tokiensis* of Döderlein seems to be identical with this species, as the main characters in which it was supposed to differ do not seem to be tangible.

(*aurantiacus*, orange-colored.)

6. LEIOCASSIS Bleeker.

Leiocassis Bleeker, Ichthy. Archipel. Indi. Prodrom. Siluroid, 1858, p. 139 (*poecilopterus*).

The upper jaw the longer; eyes below the skin; no free circular fold round the orbit; no movable labial teeth; teeth on the palate in a continuous band; barbels 8. Dorsal short, with 7 rays, with denticulated pungent spine, the teeth not projecting upward; anal short, with less than 20 rays; caudal forked; ventral with six rays. East Indies and Japan.

(λεῖος, smooth; κάσσις, casque.)

7. LEIOCASSIS LONGIROSTRIS (Günther).

Liocassis longirostris GÜNTHER, Cat. Fish, V, 1864, p. 87; Japan.
Leiocassis longirostris JORDAN and SNYDER, Annot. Zool. Japan, III, April 3, 1901, p. 44; Japan.

Head $3\frac{3}{4}$ in length; depth 5; D. I, 7; A. 17; P. I, 9; V, 6; B. 8; interorbital space 2 in snout; more than 3 in head, least depth of tail a little more than $\frac{1}{2}$.

Trunk slightly compressed, the tail elongate, tapering. Head as high as broad, with the crown compressed, the sides obliquely sloping outward; snout much produced and conical, so that the mouth is about midway between the eye and end of the snout; eyes very small, without free circular eyelid, and much nearer the extremity of the snout than the end of the operculum; cleft of the mouth transverse, entirely at the lower side of the snout; teeth villiform, in broad bands, the intermaxillary band 4 times as broad as long, and the vomerine band, which is immediately behind, nearly as broad and long as the former; the posterior nostril nearer to the eye than to the extremity of the snout, and its barbel is slender, not much longer than the eye; the anterior nostril is in the upper lip in front of the maxillary barbel; maxillary and mandibular barbels small; upper side of the head only slightly granulated, the median fonticulus does not extend to the base of the occipital process, the latter finely granulated, arrow-shaped, twice as long as broad, and below the skin it extends on to the basal bone of the dorsal spine, which is elongate, triangular, and finely granulated; a skinny space between the basal bone and the granulated part of the occipital process; opercles covered with skin. The gill-membranes are separate nearly to the front of the isthmus.

Dorsal spine strong, not much shorter than the head; its serrature behind does not point either downward or upward, but is vertical to the spine, and as long as and terminates in the same vertical with the adipose fin; caudal deeply forked; pectoral spine somewhat stronger and shorter than that of the dorsal fin; the ventrals extend somewhat beyond the origin of the anal. The free portion of the tail between adipose and caudal fin equals the base of the adipose fin, and is a little less than $\frac{1}{5}$ the total (without caudal). Humeral process of moderate size, pointed behind; mucous cavity in the axil with 2 foramina. Length 23 inches.

Japan; collection of Mr. Jamrach. (Günther.)

This species was not seen by us, and may possibly not be really Japanese.

(*longus*, long; *rostrum*, snout).

7. LIOBAGRUS Hilgendorf.

Liobagrus[a] HILGENDORF, Sitzungs. Gesellsch. naturforsch. Freund., Berlin, 1878, p. 1 (*reinii*).

Body elongate with compressed tail and rounded caudal. Head broad and depressed; top of head smooth, and the humeral process smooth; eyes small and covered with thin skin, anterior in position; snout broad, obtuse, and projecting; teeth only in jaws, in broad villiform bands, and those on the mandible divided; no teeth on palatines and vomer; barbels 8, the median mentals widely separated. Dorsal fin placed anteriorly; dorsal and pectoral spines smooth, sharp, and imbedded in the skin; adipose fin long and low, joined to the caudal as in *Noturus;* ventral fins small, not reaching the anal, which has 15 rays.

(λεῖος, smooth, *Bagrus.*)

8. LIOBAGRUS REINI Hilgendorf.

Liobagrus reinii HILGENDORF, Sitzungs. Gesellsch. naturforsch. Freund., Berlin, 1878, p. 1; Southern Japan.—SAUVAGE, Bull. Soc. Philomat., 1883, p. 2; Lake Biwa.—JORDAN and SNYDER, Annot. Zool., Japan, III, 1901, p. 44.

Gn.? Sp.? ISHIKAWA, Prel. Cat., 1897, p. 23, Nos. 414, 415, 416; Toshima, Iwashiro, Kii.

Head $4\frac{1}{2}$ in length; depth 8; D. I, 6; A. 15; P. I, 7; V. 6; width of head, $1\frac{1}{4}$ in its length; interorbital space 3 in head; eye 2 in interorbital space; caudal equal to head.

Body elongate, of rather uniform depth, and the tail strongly compressed. Head broad, depressed, with a more or less swollen appearance above; snout short, much less than the interorbital space, very broad and obtuse; eyes small, superiorly lateral, and covered with thin skin; mouth very broad, transverse, and about equal to half the length of the head; lips moderate, the upper jaw projecting; teeth in a single broad villiform band in the upper jaw, and in 2 narrowly

[a] The diagnosis of this genus and species is as follows: "*Liobagrus* nov. gen., Familie *Siluridæ*, Gruppe *Bagrina*. Fettflosse lang, niedrig; Dorsalis kurz, mit I stechenden, ungesägten und 6 weichen Strahlen; Analis kurz; Caudalis abgerundet; Ventralis mit 6 Strahlen. Eight Bartfäden. Zähne nur im Zwischen—und Unterkiefer, als Flecken von Hechelzähnen auftretend, keine Vomer—und Gaumenzähne (darauf soll der Name hindeuten). Augen unter der Haut, ohne Falte darum. Kiemenhaut bis ganz nach vorn hin frei.—Unter den durch Fehlen der Gaumenzähne verwandten asiatischen Bagrinengattungen ist *Acrochordonichthys* durch enge Kiemenöffnung, *Akysis* durch ausgeschnittene Schwanzflosse, *Olyra* durch mehr als 20 Analstrahlen, *Branchiostegus* durch hervorragenden Unterkiefer zu unterscheiden. Die amerikanischen Gattungen haben 8 strahlige Bauchflossen. *Liobagrus Reinii* sp. n., Br. 15, D. $\frac{1}{6}$, A. 15, P. $\frac{1}{7}$, V. 6.—1 Exemplar, 9 cm. lang, von Prof. Rein im südlichen Japan aufgefunden. Mit den bisher bekannten japanischen Bagrinen, *Pseudobagrus aurantiacus* Schl. und *Liocassis longirostris* Günth., nach Obigem sicher nicht identisch."

divided similar patches on the mandible; palatines and vomer toothless; 2 nasal barbels, 2 longer maxillaries, and 2 still longer outer mentals which are about equal to the length of the head; inner mental barbels far apart and much shorter than the maxillaries; interorbital space broad and more or less flattened. Gill openings large, rather inferior, and the membrane with a deep notch; isthmus broad; branchiostegals large.

Body naked and smooth; top of head smooth.

Dorsal beginning before the tip of the pectoral spine, a little nearer tip of snout than base of ventrals, its spine smooth, without serrations, and more than half the height of the fin; the adipose fin is long, low, ascending gradually till above and beyond the tip of the anal, and adnate to the caudal by means of the rudimentary rays of the latter; origin of anal a little nearer the tip of caudal than the tip of snout,

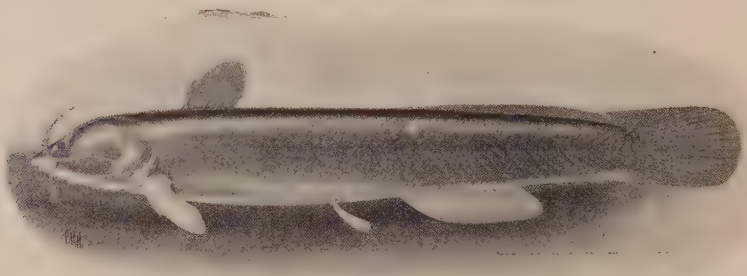

FIG. 2.—LIOBAGRUS REINI.

and well separated from the caudal; caudal truncately rounded; pectoral spine smooth, sharply pointed, slightly curved, and more than half the length of the fin, which is equal to the width of the head, ventrals small, beginning beyond tip of dorsal, a little longer than the pectoral spine, and not reaching the anal.

Length $3\frac{1}{5}$ inches.

This description from a specimen from Tsuyama.

Southern Japan, our specimens from Niigata in Echigo (collected by Eitaro Iijima); from Tsuyama and from Nagoya in Owari (collected by K. Otaki).

(Named for Dr. Rein, an eminent student of Japanese history.)

To the *Liobagrus reini* probably belongs a species described in manuscript by Dr. Ishikawa, under the vernacular name of *Akaza* (red thing).

The body comparatively short and thick. The head flattened, rather small, its width $3\frac{3}{4}$ in the total length of the body; its depth about $\frac{2}{3}$; its length $3\frac{1}{2}$. The spines stout; the pectoral spine straight, situated at $3\frac{1}{3}$ in the distance from the snout to the dorsal, and not serrated, and with a groove on the ventral side. The dorsal fin higher than long, its origin is midway between the anal and the snout, its

spine nearly as long as the longest dorsal ray. The number of anal rays 14. The upper jaw projecting. The humeral process short and sharp. Color: Nearly uniform reddish-brown, with numerous spots, the ventral surface lighter colored. Small siluroid fish living under stones and rocks in rocky streams, attaining the length of 105 mm.

Found in different places in Hokkaido and in the Main Island; our specimens in the Museum are from Toshima in Hokkaido, and from Iwashiro, Owari, Kii, and from Mimasaku. (*Ishikawa*, MS.)

SUMMARY.

ORDER NEMATOGNATHI.

FAMILY I. PLOTOSIDÆ.

1. PLOTOSUS Lacépède.

1. *anguillaris* (Lacépède); Tokyo, Misaki, Wakanoura, Mogi, Nagasaki; in the sea.

FAMILY II. SILURIDÆ.

2. *Tachysurus* Lacépède.

2. *maculatus* (Thunberg).

3. *Parasilurus* Bleecker.

3. *asotus* (Linnæus); Tokyo, Morioka, Niigata, Tana R., Kawatana, Sendai, Ichinoseki, Chikugo R., Tsuchiura, Lake Biwa, Formosa.

4. *Fluvidraco* Jordan and Fowler.

4. *ransonnetii* (Steindachner); Wakanoura, Tsuruga, Lake Biwa, Lake Yogo, Yodo R., Nagoya.

5. *nudiceps* (Sauvage).

5. *Pseudobagrus* Bleeker.

6. *aurantiacus* (Schlegel); Tokyo, Kinu R., Tana R., Tsuchiura, Kitakami R.

6. *Leiocassis* Bleeker.

7. *longirostris* Günther.

7. *Liobagrus* Hilgendorf.

8. *reini* Hilgendorf; Tsuyama, Niigata, Nagoya.